

# Estimation of the maximum displacement response in structures with linear behaviour

Pedro Vieira<sup>1</sup>, Paula Milheiro-Oliveira<sup>2</sup>,  
and Álvaro Cunha<sup>2</sup>

<sup>1</sup>*University of Trás-os-Montes e Alto Douro, Portugal*

<sup>2</sup>*University of Porto, Portugal*

## Abstract

The response of a structure characterized by a single degree of freedom and excited by gaussian white noise is investigated in terms of its maximum absolute displacement. The mean and mean square of the maximum absolute displacement are studied based upon different approaches. Statistics and mean values are computed by simulating the process obtained by discretizing the exact solution of the motion equation and are compared with analytical techniques: the Poisson method, the Vanmarcke method and the ACC method. The Poisson and Vanmarcke methods constitute classical approximations to this problem. The ACC (Advanced Censored Closure) method is more recent (Muscolino, 2007) and is based on the assumption of a Gumbel model for the maximum of i.i.d. Gaussian variables. It is known to be suitable for stationary responses but it produces bad results when the response is non-stationary. In this study, we show that the Generalized Extreme Value (GEV) distribution is more suitable to solve this problem than the Gumbel model. The parameters of the GEV distribution were estimated based on the L-moments method. As a consequence the ACC method was modified to include a GEV distribution of type II. We also concluded that the results obtained using the GEV distribution in the ACC are more accurate than those obtained by the other two methods.

## Keywords

Stochastic differential equations, Maximum absolute response, ACC method, GEV distribution.

## References

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